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REMARKS

The application has been reviewed in light of the Office Action dated April 19, 2007.

Claims 1-45 were pending, with claims 1-22 having been withdrawn by the Patent Office from consideration.   By this Amendment, claims 23-31 and 33-36 have been canceled, without prejudice or disclaimer, claims 32 and 40 have been amended to clarify the claimed subject matter, and new claims 46-54 have been added. Accordingly, claims 32 and 37-54 are presented for reconsideration, with claims 32 and 46 being in independent form.

The title was objected to as purportedly not descriptive.

By this Amendment, the title has been amended to be more descriptive.

Withdrawal of the objection to the title is respectfully requested.

Claims 39 and 40 were rejected under 35 U.S.C. §112 first paragraph, as purportedly failing to comply with the enablement requirement. Claims 39-40 were rejected under 35 U.S.C. §112, second paragraph, as allegedly indefinite.

The present application relates to improved techniques devised by applicant for processing a color image. Color image processing typically involves data mapped to a color space. In image formation, conversion from one color space to another color space is often needed, depending on the output media and other circumstances.

Points in color spaces are typically represented by a plurality of signals. In one example, a color space can be represented by a combination of C, M, Y color density signals along with a K (that is, black) signal. The collection of these signals is often referred to as color signals. It should be noted that the claimed subject matter of independent claims 32 and 46 of the present application is not limited to operation in the CMYK color space.

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In any event, color signals, in many instances, are not used directly in image formation, because the materials (for example, inks) used in image formation do not have a one-to-one relationship to the colors signals, and/or the quantity of a material to be used does not have a linear relationship to the color signal. Therefore, color signals are typically converted to color material signals for use to control amounts of materials to apply in image formation.

A process for determining the combination of color materials (that is , conversion from color signals to color material signals) for obtaining reproduction of a color, in a particular set of circumstances, can include determining an amount of black to include, and as an example, a table (or another mapping means) may be used for such purposes. In creating the table, a line extending between white and black, and lines extending between black and primary and/or secondary colors can be defined for determining an amount of black within a color reproduction range according to the lines. Thus, one can determine a suitable amount of black per hue.

The brief explanation above is a summary of some relevant discussions in the background section of the application. Figs 3-9 and the corresponding discussion in the specification of this application (for example, starting at page 29) are also instructional and relevant with respect to the subject matter of claims 39 and 40.

It is submitted that in view of the background section of the application, Figs 3-9 and the corresponding discussion in the specification, and the claim amendments made herewith, claims 39 and 40 clearly satisfy the requirements of enablement and definiteness under 35 U.S.C. §112.

Accordingly, withdrawal of the rejections under 35 U.S.C. §112 is respectfully requested.

Claims 23-27, 30-33, 36-40, 44 and 45 were rejected under 35 U.S.C. § 102(b) as purportedly anticipated by U.S. Patent No. 6,307,644 to Ohta et al. Claims 28, 29, 41 and 42

were rejected under 35 U.S.C. § 103(a) as purportedly unpatentable over Ohta in view of Saito et

al. (US 2002/0021458 A1).   Claims 34 and 43 were rejected under 35 U.S.C. § 103(a) as

purportedly unpatentable over Ohta in view of U.S. Patent No. 5,930,388 to Murakami et al.

Claims 35 were rejected under 35 U.S.C. 103(a) as purportedly unpatentable over Ohta in view

of Murakami and further in view of U.S. Patent No. 5,180,008 to Asada.

By this Amendment, claims 23-31 and 33-36 have been canceled, without prejudice or

disclaimer, and therefore the rejections are moot with respect to the canceled claims.

Applicant respectfully submits that independent claims 32 and 46 of the present

application is patentable over the cited art, for at least the following reasons.

As pointed out above, the present application relates to improved techniques devised by

applicant for image processing.

In one aspect of the present application, conversion of a color signal into a color material

signal is performed, including defining a first line, defining one or more second lines, defining

one or more third lines, determining one or more color material signals on the first, second, and

third lines, and obtaining a color material signal situated between any of the first, second, and

third lines by interpolation according to the first, second, and third lines. In the approach devised

by applicant, the first line extends between white and black, the second lines extend between

black and a primary color and/or a secondary colors, and the third lines connect black with one

or more points situated between white and a primary color or a secondary color. In addition, the

amount of black for each point on the first, second and third lines is determined according to a

distance from black, and a black starting point for the third line starts later compared to black

starting points for the other lines.   Each of independent claims 32 and 46 of the present

application addresses these features, as well as additional features.

Since graininess of human skin color in an image tends to be more noticeable compared to other areas (as discussed in the application, for example, at page 48, line 12 through page 49, line 3), the amount of black for the third line, which passes through a human skin color point, is to be determined more carefully compared to the other lines. Hence, by having the black starting point for the third line start later compared to the black starting points for the other lines (i.e., determining the lightness of the third line lower than those of the other lines), image quality can be enhanced. This is an example of the advantageous applications of the subject matter of independent claims 32 and 46.

Ohta, as understood by applicant, proposes an approach for performing color processing wherein an input color signal is converted into color components and a brightness component, the color components and the brightness component are utilized to read data from a look-up table, and interpolation processing is performed on the basis of the read data to generate output device dependent color-component data corresponding to the input signal.

Ohta, column 3, lines 35-48, which was cited in the Office Action, states as follows:

> FIGS. 6 and 7 show a method of constructing a look-up table according to this interpolation method. As shown in these figures, in this interpolation method, the construction is formed such that the hexagon on the top surface is divided into a plurality of regular triangles, and a plurality of straight lines which extend from each apex of these triangles to the Black (indicated by the arrows in FIG. 7) is made to have N lattice points. These lattice points are indicated by (°) in the figures.
> The output value of the input color P is determined on the basis of these lattice points by an interpolation method described below.

Ohta, Figs. 6 and 7, show a color range having an achromatic line connecting white and black and an outermost boundary line connecting a primary color and a secondary color.

However, applicant does not find teaching or suggestion in Ohta of an image processing

method for converting a color signal into a color material signal including defining a first line,

defining one or more second lines, defining one or more third lines, determining one or more

color material signals on the first, second, and third lines, and obtaining a color material signal

situated between any of the first, second, and third lines by interpolation according to the first,

second, and third lines, wherein the first line extends between white and black, the second lines

extend between black and a primary color and/or a secondary colors, the third lines connect

black with one or more points situated between white and a primary color or a secondary color,

the amount of black for each point on the first, second and third lines is determined according

to a distance from black, and a black starting point for the third line starts later compared to

black starting points for the other lines, as provided by the subject matter of claim 32 of the

present application.

The other cited references do not cure the deficiencies of Ohta.

Saito, as understood by applicant, proposes an approach for color reproduction in an

image forming apparatus wherein a table is utilized for separating colors into color material

colors, a line enabling a maximum color reproducible range of the image forming apparatus and

an internal line for the color reproducible range of the image forming apparatus are defined, and

interpolation is performed based on the line enabling maximum color reproducible range and the

internal line. In the approach proposed by Saito, the black starting point is determined for

suppressing the influence of graininess.

Murakami, as understood by applicant, proposes an approach for color image processing

which utilizes a first lattice for dividing a color separation signal space in the form of a lattice so

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as to store in a table coordinates of lattice points of the color separation signal space thus divided, and a second lattice for further dividing a specific unit cube of the lattice in the form of a lattice so as to additionally store in the table coordinates of lattice points of the specific unit cube thus divided. One of plural color correction methods having different conversion accuracies is selected, according to whether or not input image data belong to the specific unit cube of the lattice.

Asada, as understood by applicant, proposes an approach for setting color separation in a color image processor, wherein a color original image is pre-scanned in order to detect respective color components of sample pixels, then it is decided whether each sample pixel has color components corresponding to a designated memory color (for example, the color of the sky, trees, or the like) within a predetermined allowable error range, and when the number of sample pixels having the memory color is larger than a threshold value, a predetermined color separation rule is corrected to obtain a corrected color separation rule which is used for separating the color original image into components suited for reproduction of an image corresponding thereto.

Applicant does not find teaching or suggestion in the cited art, however, of an image processing method for converting a color signal into a color material signal including defining a first line, defining one or more second lines, defining one or more third lines, determining one or more color material signals on the first, second, and third lines, and obtaining a color material signal situated between any of the first, second, and third lines by interpolation according to the first, second, and third lines, wherein the first line extends between white and black, the second lines extend between black and a primary color and/or a secondary colors, the third lines connect black with one or more points situated between white and a primary color or a secondary color,

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the amount of black for each point on the first, second and third lines is determined according to a distance from black, and a black starting point for the third line starts later compared to black starting points for the other lines, as provided by the subject matter of claim 32 of the present application.

Independent claim 46 is patentably distinct from the cited art for at least similar reasons.

In view of the amendments to the remarks hereinabove, Applicant submits that the application is now in condition for allowance. Accordingly, Applicant earnestly solicits the allowance of the application.

If a petition for an extension of time is required to make this response timely, this paper should be considered to be such a petition. The Patent Office is hereby authorized to charge any fees that are required in connection with this amendment and to credit any overpayment to our Deposit Account No. 03-3125.

If a telephone interview could advance the prosecution of this application, the Examiner is respectfully requested to call the undersigned attorney.

Respectfully submitted,

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